

**BEFORE THE  
PUBLIC SERVICE COMMISSION OF WISCONSIN**

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Application of Highland Wind Farm, LLC, for a  
Certificate of Public Convenience and Necessity  
To Construct a 102.5 MW Electric Generation  
Facility and Associated Electric Facilities, to be  
Located in the Towns of Forest and Cylon,  
St. Croix County, Wisconsin

Docket No. 2535-CE-100

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**CLEAN WISCONSIN'S COMMENTS ON ORDER TO REOPEN, NOTICE AND REQUEST FOR  
COMMENTS**

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Clean Wisconsin appreciates this opportunity to respond to the Commission's Request for Comments regarding the issues remanded by the Decision and Order in *Town of Forest v. Pub. Serv. Comm'n of Wis.*, No. 14-CV-18 (Wis. Cir. Ct. St. Croix Cnty. Aug. 27, 2015). Clean Wisconsin here addresses the two issues remanded to the Commission for further action and comments on the two governmental reports cited in the Commission's March 15, 2016 Order to Reopen, Notice and Request for Comments.

**I. The Final Decision Should Be Modified to Remove the 95% Compliance Standard.**

Clean Wisconsin supports the Commission's proposal to remove the 95 percent compliance standard from its Final Decision (order point 16). As noted by the Commission in its Final Decision on Reopening, although Wisconsin Admin. Code § PSC 128 sets forth maximum noise limits, neither measurement technology nor "what constitutes compliance with this absolute limit" is set forth in the rule.<sup>1</sup>

In fact, the Commission based its determination that Highland could comply with noise limits set forth in § PSC 128.14(3) on extensive modeling using conservative assumptions.<sup>2</sup> To add even more certainty, the rigorous "Post Construction Noise Monitoring Plan" was designed to confirm modeling predictions and ensure that the Commission could effectively respond to complaints about noise and enforce the sound limits in the CPCN order. Using very conservative modeling assumptions and imposing a robust monitoring and reporting protocol is more than adequate for the purposes of ensuring compliance with

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<sup>1</sup> Final Decision on Reopening, PSC ref. #192339, p. 35.

<sup>2</sup> *Ibid.*, page 25.

noise limits for the project; to also impose a percentage-based compliance standard is unnecessary and inconsistent with past Commission practice when approving CPCN applications for wind energy projects.

Although there was testimony throughout the proceeding regarding various percentage standards, the Commission itself stated that the record should be further developed on this issue and “some sort of percentage based standard” submitted for the Commission’s consideration.<sup>3</sup> That record has not been developed, and therefore imposition of a percentage based compliance standard on Highland Wind (or indeed any particular project), without full consideration of evidence regarding such a standard, alternatives, and an opportunity for hearing would be premature and lack a proper basis.

## **II. There is No Basis for Ordering Lower Noise Requirements for “Potentially Sensitive Residences.”**

### **A. There is no evidence that wind turbines cause or exacerbate health problems.**

As noted in its Final Decision on Reopening, Oct. 25, 2013:

“...the Commission is not convinced that a causal link between audible or inaudible noise at wind generating facilities and human health risks has been established to a reasonable degree of scientific certainty.”<sup>4</sup>

The Decision went on to explain that although the Commission had doubts whether turbine noise at any level could cause or worsen any of the self-reported conditions individuals living in the six occupied residences may have, it would accept, out of “an abundance of caution,” Highland’s voluntary agreement to obligate itself to a lower limit of 40 dBA for the six identified residences.<sup>5</sup> The Decision further states:

“The Commission is requiring 40 dBA at certain residences during the nighttime hours because Highland has voluntarily agreed to this more stringent standard. Further, *there is no evidence in the record that demonstrates how a 40 dBA limit may remedy any issues a wind turbine may allegedly create near the sensitive residences.*” (*emphasis added*).<sup>6</sup>

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<sup>3</sup> Final Decision, Docket No. 2535-CE-100

<sup>4</sup> Final Decision on Reopening, p. 16

<sup>5</sup> *Ibid.*

<sup>6</sup> *Ibid.*, p. 17.

That Highland Wind was willing to redesign its project layout in order to accommodate the concerns of local residents, even in the absence of evidence that noise from their turbines would have any impact whatsoever on those residents, speaks to the company's goodwill and sense of responsibility. Whether Highland Wind chooses to accommodate the wishes of local residents is their decision; however, the Commission should not order any such concessions because there is no evidence that doing so would have any effect on the health of those residents.

The Wind Siting Council and PSC staff, relying on scientifically sound, peer-reviewed studies to establish sound limits for wind energy systems in § PSC 128, reached the same conclusion. For example, both of the documents of which the Commission is taking official notice in this proceeding make conclusions regarding wind turbines and health impacts that are consistent with the Commission's finding in the CPCN Order. The Wisconsin Wind Siting Council found in its 'Research Conclusions' that:

Based on the strength of the information that is available, it is reasonable to conclude that the majority of individuals living near wind energy systems do not experience adverse health effects or reduced well-being.... It is currently not possible, based on available research, to conclude with scientific certainty whether ... adverse health effects are caused by wind energy systems. Furthermore, there exists empirical research suggesting that these issues are affected by factors including expectations of health impacts and personal attitudes and opinions with regards to wind energy systems.<sup>7</sup>

The report from PSC staff examining peer-reviewed literature that was published subsequent to the WSC report found that "[t]he recent literature on this subject continues to reach conclusions similar to those identified in the 2014 WSC report."<sup>8</sup> It also found that, while "studies have found an association between exposure to wind turbine noise and annoyance for some residents near wind energy systems," there was little and "conflicting evidence demonstrating an association or a causal relationship between wind turbines and sleep disturbance."<sup>9</sup> With regard to other health outcomes, the report was unequivocal, stating that "There is a lack of evidence to support other hypotheses regarding human health effects caused by wind energy systems," and finally concluding that the state of scientific research at the time was "insufficient to determine causal relationships between variables."<sup>10</sup>

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<sup>7</sup> Wind Siting Council, Wind Turbine Siting-Health Review, 2014.

<sup>8</sup> Review of Studies and Literature Relating to Wind Turbines and Human Health, Dec. 2015.

<sup>9</sup> *Ibid.*

<sup>10</sup> *Ibid.*

A thorough literature review<sup>11</sup> revealed 10 new relevant peer-reviewed studies since the publication of that PSC staff report. All of these studies, discussed below, provide further information to refute any proposed link between wind turbine noise (WTN) and health effects. Of particular note, there is significant recent evidence that there is in fact no causal link mediated by annoyance from WTN to health outcomes. For example, a series of articles detailing results from the major Health Canada study of issues related to impacts from wind turbine noise has now been peer-reviewed and published. Findings from those articles include that, even at the highest calculated sound levels (46 dB), “Beyond annoyance, results do not support an association between exposure to WTN ... and the evaluated health-related endpoints”;<sup>12</sup> that “Self-reported health effects (e.g., migraines, tinnitus, dizziness, etc.), sleep disturbance, sleep disorders, quality of life, and perceived stress were not related to WTN levels”;<sup>13</sup> and that “the findings do not support an association between exposure to WTN ... and elevated self-reported and objectively defined measures of stress”.<sup>14</sup>

Other new research outside of that Health Canada study also provides further evidence counter to the idea that there may be a link between any annoyance from wind turbine noise and health outcomes. For example, Blanes-Vidal and Schwartz, in a study designed specifically to examine that proposed link stated:

*In our study we did find a significant association between residential proximity to wind turbines and wind turbine annoyance, but annoyance was not further associated with [health] symptoms... Therefore, our results did not support the existence of these mediating pathways [from annoyance to health symptoms] and an indirect effect could not be established.*<sup>15</sup>

That study went on to look in more detail at the potential for any direct link between wind turbines and health symptoms (i.e. not mediated by an annoyance pathway), about which they clearly conclude “our study did not show any evidence of a relationship between residential proximity to wind turbines and

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<sup>11</sup> All articles containing the terms “wind turbine” and “health” or “annoyance” in the databases Academic Search Premier, Google Scholar, JSTOR, ProQuest Research Library, PubMed, and Web of Science.

<sup>12</sup> Michaud, et al. *Exposure to wind turbine noise: Perceptual responses and reported health effects*. J. Acoust. Soc. Am. 139 (3), March 2016.

<sup>13</sup> *Ibid.*

<sup>14</sup> Michaud, et al. *Self-reported and measured stress related responses associated with exposure to wind turbine noise*. J. Acoust. Soc. Am. 139 (3), March 2016.

<sup>15</sup> V. Blanes-Vidal and J. Schwartz. *Wind turbines and idiopathic symptoms: The confounding effect of concurrent environmental exposures*. Neurotoxicology and Teratology. 2016, doi: 10.1016/j.ntt.2016.03.066 (Online ahead of print).

health symptoms.”<sup>16</sup> Indeed, they noted that “self reported health effects of people living in proximity to wind turbines are not unique to wind turbines,”<sup>17</sup> but that instead “annoyance, health risk perception and behavioural [changes] caused by agricultural odor exposures, and behavioural [changes] caused by noise different from wind turbines”<sup>18</sup> were confounding factors. Controlling for those confounding factors showed that any correlations between wind turbines and health in their study were spurious, and further suggested regarding other studies that “isolated associations between wind turbines exposures and health outcomes reported in the literature may be partly due to confounding bias.”<sup>19</sup>

This last point is in keeping with evidence from other recent research, that factors other than wind turbine noise level play a significant role in determining the reported outcomes, such as a report of Michaud et al where:

[T]he association between WTN levels and annoyance was found to be rather weak ... The self-reported high concern about physical safety from having wind turbines in the area was found to be significantly related to WTN annoyance. This finding is reminiscent of the general observation from community noise research that fear of a noise source may be the most important nonacoustic variable related to annoyance.<sup>20</sup>

It is also in keeping with other new studies showing on similar topics that show, for example, that health impacts from high-voltage transmission lines are explained by the nocebo effect (in which fear of health impacts is significantly correlated with reported symptoms, but actual proximity was not),<sup>21</sup> or that find annoyance from wind turbine shadow flicker is not strongly predicted by calculated minutes of shadow flicker alone, but that any relationship is powerfully affected by other factors.<sup>22</sup>

These findings shed a light on recent findings like those from Kageyama et al, who conducted a nationwide survey in Japan. They found that the relationship between reported sleep impacts and wind

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<sup>16</sup> *Ibid.*

<sup>17</sup> *Ibid.*

<sup>18</sup> *Ibid.*

<sup>19</sup> *Ibid.*

<sup>20</sup> Michaud, et al. *Personal and situational variables associated with wind turbine noise annoyance*. J. Acoust. Soc. Am. 139 (3), March 2016.

<sup>21</sup> Porsius, et al. *Nocebo responses to high-voltage power lines: Evidence from a prospective field study*. Sci. of Tot. Env. 543(2016) 432-438, November 2015.

<sup>22</sup> Voicescu, et al. *Estimating annoyance to calculated wind turbine shadow flicker is improved when variables associated with wind turbine noise exposure are considered*. J. Acoust. Soc. Am. 139 (3), March 2016.

turbine noise was “modified by self-reported noise sensitivity and visual impact,”<sup>23</sup> but did not examine whether the relationship continued to exist when those and other external factors (e.g. health risk perception) were controlled for and found “no association of noise exposure level with poor physical/mental health.”<sup>24</sup> That they also found, in the only group that showed an association with sleep impacts, “health complaints tended to be prevalent ... even in the control sites,”<sup>25</sup> provides further indication that wind turbine noise may not be causal of the reported symptoms. Indeed, other studies show that “ambient noise levels can exceed wind turbine noise,”<sup>26</sup> and that at the high wind speeds where WTN levels would be the highest, WTN can be “concealed by the background noise evoked by the wind.”<sup>27</sup>

Finally, to the extent that a commonly stated point of concern has been health impacts from infrasound or low frequency noise (together “IFLN”, generally defined as frequencies below 200 or 250 Hz) associated with WTN, there has been an argument that measurements keyed to audible sound by use of the standard A-weighting of sound measurement should be replaced with a C-weighting that is more sensitive to those lower frequencies (to which the human ear is less sensitive). Following from that has also been a related argument: that a number of existing studies showing little to no impact from WTN should be discounted because they used those standard A-weighted sound measurements, and do not explicitly examine IFLN. Recent studies by Keith et al have refuted both of these arguments however, by examining the relationship between A-weighted and C-weighted sound from wind turbines, and concluding that “Given [the] one-to-one relationship between A- and C-weighted values there is no statistical advantage to using one metric over the other for WTN...”<sup>28</sup>, and that “The simple relationship between A- and

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<sup>23</sup> Kageyam, et al. *Exposure-response relationship of wind turbine noise with self-reported symptoms of sleep and health problems: A nationwide socioacoustic survey in Japan*. Noise and Health. 18 (81) 53-61, 2016.

<sup>24</sup> *Ibid.*

<sup>25</sup> *Ibid.*

<sup>26</sup> Keith, et al. *Wind turbine sound pressure level calculations at dwellings*. J. Acoust. Soc. Am. 139 (3), March 2016.

<sup>27</sup> Katinas, Marciukaitis, and Tamasauskiene. *Analysis of the wind turbine noise emissions and impact on the environment*. Ren. and Sust. Energy Rev. 58(2016)825–831. January, 2016.

<sup>28</sup> Keith, et al. *Wind turbine sound pressure level calculations at dwellings*. J. Acoust. Soc. Am. 139 (3), March 2016.

C- weighted levels suggests that there is unlikely to be any statistically significant difference between analysis based on either C- or A-weighted data.”<sup>29</sup>

Based on the Wind Siting Council report detailing the extent of scientific research up through 2014, the PSC Staff report detailing such research through 2015, and the extent of new evidence from peer-reviewed scientific literature since the PSC Staff report, it is clear that the Commission remains justified in its conclusion that there is “[no] causal link between audible or inaudible noise at wind generating facilities and human health risks has been established to a reasonable degree of scientific certainty.” Therefore, there is no reason for the Commission to stray from its finding that the limits currently established in Wis. Admin. Code ch. PSC 128, are protective of public health and welfare, and there is no reason or justification for providing lower noise requirements for either the six previously identified residences, or any additional residences.

#### **B. What Constitutes a “Sensitive Residence” Has Never Been Defined.**

Absent some definition of the terms “sensitive residence” or “special needs” in the context of this proceeding, it is impossible to determine which, if any, homes would qualify for special treatment, even if such treatment was warranted. Indeed, it is impossible to ascertain what type or degree of “special treatment” might be adequate to mitigate a variety of speculative impacts on a variety of pre-existing health conditions. In Ex.-Forest-Junker-20, a wide variety of existing health concerns was reported among Forest residents, including autism, high blood pressure, heart conditions, anxiety, headaches, hearing problems, motion sickness, arthritis, diabetes, vertigo, COPD, asthma, depression, and Parkinson’s disease.<sup>30</sup> However, the Commission did not make a determination regarding which particular maladies were most likely to worsen as a result of proximity to wind turbines, why those maladies might worsen, or what modifications to the project design would prevent adverse impacts. Indeed, the Commission’s view was that “there is no evidence in the record that demonstrates how a 40 dBA limit may remedy any issues

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<sup>29</sup> Keith, et al. *Wind turbine sound power measurements*. J. Acoust. Soc. Am. 139 (3), March 2016

<sup>30</sup> It should be noted that these health concerns were reported in response to a Town-administered questionnaire wherein residents simply checked boxes such as “headaches” and “anxiety” without reference to the frequency, severity, onset, duration, possible causes, or treatability of their symptoms.

a wind turbine may allegedly create near sensitive residences.”<sup>31</sup> Thus, there is no basis whatsoever for selecting “sensitive residences,” whether six or seventeen or some other number, because the scope of the term “sensitive” has not been defined and the Commission has already determined, based on the record before it, that no causal link between audible or inaudible noise at wind generating facilities and human health risks has been established to a reasonable degree of scientific certainty.<sup>32</sup> This conclusion, which was not appealed, remains the standard by which the Commission must evaluate whether deviation from the noise standards in § PSC 128.14(3), standards that were promulgated as a result of the Wind Siting Council’s thorough analysis of possible impacts to human health, is warranted.

Therefore, the Commission should not impose sound limits that differ from those specified in § PSC 128 on any residences in the project area, because there is no evidence that wind turbine noise impacts human health and even if it did, the record in this case is insufficient to justify special treatment for any particular residences.

### **III. The Commission Should Take Official Notice of Peer-Reviewed Studies.**

It is appropriate for the Commission to take official notice under § 227.45, Wis. Stats., of governmental reports of peer-reviewed studies, as identified in the Request for Comments. Clean Wisconsin appreciates the Commission’s decision to limit their official notice to studies that are scientifically sound, published in peer-reviewed literature, and therefore reliable.

### **V. Conclusion**

For the reasons set forth herein, Clean Wisconsin respectfully requests that the Commission remove both the 95% compliance standard requirement and any sound limits below those required in Wis. Admin. Code § PSC 128.14(3) for the Highland Wind project. Clean Wisconsin also requests that the

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<sup>31</sup> *Ibid.*

<sup>32</sup> *Ibid.*, page 16.

Commission take official notice of the two documents identified in the Commission's Request for Comments.

Respectfully submitted this 15th day of April, 2016,

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